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In re Application of : Saranathan et al.

Serial No. : 10/605,645

Filed : October 15, 2003

For : METHOD AND APPARATUS FOR ENHANCED MAGNETIC PREPARATION IN MR IMAGING

Group Art No. : 3768

Examiner : Salieu M. Abraham

CERTIFICATION UNDER 37 CFR 1.8(a) and 1.10

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REPLY BRIEF RESPONSIVE TO EXAMINER'S ANSWER
MAILED JULY 13, 2009

Dear Sir:

This Reply Brief is being filed in response to the Examiner's Answer mailed on July 13, 2009.

REPLY BRIEF

In the Examiner's Answer mailed on July 13, 2009, the Examiner maintained the rejection of claims 1, 2, 4-14, and 16-25 and dismissed Appellant's arguments set forth in the Appeal Brief of December 9, 2008. The assertions set forth in the Examiner's Answer are addressed herebelow.

Rejection under 35 U.S.C. §103(a) over Ookawa in view of Laub and further in view of Jezzard.**Claim 1**

The Examiner maintained the rejection of claims 1, 2, 4-6, 9, 10, and 20-25 under 35 U.S.C. §103(a) as being unpatentable over Ookawa in view of Laub and further in view of Jezzard. The Examiner dismisses Appellant's arguments regarding the failure of Jezzard to teach the claimed limitation of "playing out a dummy acquisition following each of the magnetic preparation pulses." Specifically, in addressing Appellant's arguments that Jezzard is not in the same field of endeavor as Appellant's invention, the Examiner stated:

The Jezzard reference in section 6.2, discloses noise generation in images that result from the application of (MR) pulse sequences (normally in a specific/nonconventional "partially saturated state") leading to non-steady effects. Appellant's disclosure cites the intent of the proposed invention is to help to "greatly improve image quality with the reduction of ghosting artifacts typically associated with steady state effects" (See Applicant Specification, Para. [0030]). Additionally, appellant's disclosure cites "improving image quality as well as facilitating image acquisition speed/throughput (See Applicant Specification, Para. [0008]. These are significant because in addition to reducing noise related artifacts (i.e. applicant's ghosting) associated with MR pulse regimes that lead to non-steady state conditions (Jezzard p. 434, paragraph 1), the Jezzard reference discloses attempting to optimize "image quality" and minimize "the duration of the scan itself" as conditions in (rapid) acquisition MR imaging that lead to non-steady state conditions requiring the application of dummy acquisitions for correction (see Jezzard section 6.2, paragraphs 1, 2 and 4, pp. 433-434, and equations 11-13). Therefore, Jezzard discloses all three conditions disclosed by appellant as objectives of the proposed invention, and, correspondingly is not limited to conventional MR, but would be applicable to any MR acquisition or (nonconventional) partial saturation state producing pulse sequences that necessitate correction of artifact or noise effects due to non-steady state conditions (as disclosed by Jezzard and discussed *supra*).

Examiner's Answer, July 14, 2009, pp. 21-22. Appellant respectfully disagrees with the Examiner's statement. Appellant believes that Jezzard, despite allegedly disclosing the desire to optimize image quality and minimize scan duration, cannot properly be combined with Ookawa

and Laub to teach or suggest the limitation of “playing out a dummy acquisition following each of the magnetic preparation pulses”, as is called for in independent claim 1. Specifically, Appellant notes that Jezzard does not disclose the use of magnetic preparation pulses prior to data acquisition, nor does Jezzard teach the elliptical centric phase ordered acquisition of Appellant’s invention. Instead, the only MR data acquisition method disclosed by Jezzard comprises the collection of all phase-encode lines in k-space sequentially. *See Jezzard*, p. 427, Fig. 1. Appellant calls for “playing out a dummy acquisition following each of the magnetic preparation pulses”, wherein the magnetic preparation pulses are applied to data acquired in elliptic centric order. *See Specification*, Para. [0004]. Jezzard, on the other hand, only generically addresses the benefits of dummy acquisitions, and does not even disclose the use of magnetic preparation pulses prior to data acquisition, let along playing out dummy acquisitions following those magnetic preparation pulses. Thus, Appellant believes that one of ordinary skill in the art would not have been motivated to combine the sequential k-space MR data acquisition of Jezzard with the alleged elliptical centric phase ordered acquisition of Ookawa in view of Laub. Absent the present invention, there would be no logical reason why one would do so in the manner claimed.

Accordingly, in view of the arguments presented herein, and in light of the arguments previously set forth in the Appeal Brief, Appellant believes that one of ordinary skill in the art would not have been motivated to combine the teachings of Ookawa in view of Laub with the teachings of Jezzard to render the present claims obvious.

Next, regarding Appellant’s argument that Jezzard fails to teach or suggest the limitation of “playing out a dummy acquisition following each of the magnetic preparation pulses”, the Examiner stated:

However, the Jezzard reference does disclose that “[a] well-designed pulse sequence will incorporate enough ‘dummy scan’ acquisitions that when the image signal is detected, the spins have reached a steady state.” (Jezzard, Section 6.2, p. 434), as acknowledged by Appellant (see Appeal Brief p. 4, par. 2). Appellant further asserts that the proposed invention “dummy acquisitions are played out following each magnetic preparation pulse so as to reduce ghosting artifacts associated with steady state effects. *See Specification*, Para. [0026, 0030]”. (see Appeal Brief p. 4, par. 2). As discussed *supra*, Jezzard establishes applying dummy acquisitions in sufficient magnitude to restore steady state. It would be obvious to one of ordinary skill as a matter of common sense to apply the dummy scans to the degree necessary (frequency) to mitigate/eradicate and prior to the conditions (pattern) that cause the non-steady state effects. Further, the determination of the frequency of dummy scans or the acquisitions is tantamount to determining the “optimum value” of scans to apply and the determination of a results effective variable has been held to involve only routine skill in the art. (*In re Boesch*, 617 F.2d 272, 205 USPQ 215 <CCPA 1980>).

Examiner's Answer, supra at 23-24. Appellant disagrees with the Examiner's assertion. Jezzard merely discloses that “[a] well-designed pulse sequence will incorporate enough ‘dummy scan’ acquisitions that when the image signal is detected, the spins have reached a steady state,” and that “[t]his may not always be the case, though.” *Jezzard*, Section 6.2, p. 434. Thus, Jezzard only suggests some of the benefits of playing out dummy scans, but in no way does the teachings of Jezzard teach or suggest when, where, or how many such dummy scans should be played out so as to teach one of ordinary skill in the art to practice to practice the invention as claimed. In fact, in stating that “[t]his may not always be the case, though,” Jezzard suggests that a well-designed pulse sequence may not incorporate dummy scans at all.

Conversely, it must be emphasized that Appellant is not broadly claiming dummy pulses or dummy acquisitions. The claim must be reviewed as a whole, rather than each element in a vacuum. Appellant discloses that magnetic preparation pulses are applied at a variable rate to suppress magnetization in a tissue prior to MR data acquisition, while the dummy acquisitions are played out following *each* magnetic preparation pulse so as to reduce ghosting artifacts associated with steady state effects. *See Specification*, Para. [0026, 0030]. Thus, as Jezzard fails to disclose the application of magnetic preparation pulses and does not disclose the frequency or pattern of dummy scan acquisitions, Appellant believes that Ookawa in view of Laub further in view of Jezzard cannot reasonably teach or suggest the limitation of “playing out a dummy acquisition following each of the magnetic preparation pulses,” as is called for in Appellant's claim 1.

Regarding the Examiner's argument that “the determination of the frequency of dummy scans or the acquisitions is tantamount to determining the ‘optimum value’ of scans to apply and the determination of a results effective variable has been held to involve only routine skill in the art,” Appellant respectfully disagrees. Appellant is not claiming a range of dummy acquisitions, as the Examiner insinuates, but instead directly calls for dummy acquisitions played out following *each* magnetic preparation pulse. *See claim 1*. Thus, Appellant does not believe that the Examiner's “results effective variable” argument pertains to the claims at issue, as Appellant is not claiming a particular parameter that is variable. Per MPEP 2144.05(II)(B), “[a] particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognizable result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.” *See MPEP 2144.05(II)(B)*. As Appellant is not claiming a *variable* frequency of dummy acquisitions, finding the “optimum or workable ranges of said variable” cannot be applicable in the determination of obviousness with respect to Appellant's claim 1.

Accordingly, in view of the above, Appellant believes that the Examiner has failed to show that the combination of Ookawa in view of Laub further in view of Jezzard teaches or suggests each and every limitation of claim 1. As such, Appellant respectfully requests that the Board render a favorable decision and order the withdrawal of the rejection of claim 1, along with the withdrawal of the rejections to all claims dependent therefrom.

Claim 11

Claims 11-14, 16, and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Mistretta et al. in view of Ookawa and further in view of Jezzard. In regard to independent claim 11, the Examiner alleged that Mistretta et al. in view of Ookawa teaches every limitation of the claim except for the step that the computer is programmed to “play out a dummy acquisition following each of the magnetization pulses.” *See Examiner’s Answer*, supra at pp. 15-16. Once again, however, the Examiner stated that Jezzard “has been shown to teach playing out a dummy acquisition following each of the magnetization pulses.” *Id.* However, for the same reasons set forth above with respect to independent claim 1, Appellant believes that the combination of Mistretta et al. in view of Ookawa further in view of Jezzard cannot be shown to teach or suggest the limitation of “play(ing) out a dummy acquisition following each of the magnetic preparation pulses,” as neither Mistretta et al., Ookawa, nor Jezzard teach or suggest playing out dummy acquisitions following each magnetic preparation pulse during MR imaging, or any reason why one would do so.

Accordingly, in view of the above, and further in view of the arguments set forth in the Appeal Brief, Appellant believes that the Examiner has failed to show that the combination of Mistretta et al. in view of Ookawa further in view of Jezzard teaches or suggests each and every limitation of claim 11. As such, Appellant respectfully requests that the Board render a favorable decision and order the withdrawal of the rejection of claim 11, along with the withdrawal of the rejections to all claims dependent therefrom.

Claims 20

Considering independent claim 20, the Examiner again relied upon Ookawa in view of Laub and further in view of Jezzard to allegedly teach that which is called for in the claim. However, claim 20 calls for the limitation of “play out a dummy acquisition following each of the magnetic preparation pulses.” *See claim 20.* Thus, for the same reasons set forth above with respect to independent claim 1, Appellant believes that the combination of Ookawa in view of

Laub further in view of Jeppard cannot be shown to teach or suggest the limitation of “play(ing) out a dummy acquisition following each of the magnetic preparation pulses.”

Accordingly, in view of the above, Appellant believes that the Examiner has failed to show that the combination of Ookawa in view of Laub further in view of Jeppard teaches or suggests each and every limitation of claim 20. As such, Appellant respectfully requests that the Board render a favorable decision and order the withdrawal of the rejection of claim 20, along with the withdrawal of the rejections to all claims dependent therefrom.

In view of the above remarks, Appellant respectfully submits that the Examiner has provided no supportable position or evidence that claims 1, 2, 4-6, 9, 10, and 20-25 are not patentable. The combination of Ookawa, Laub, and Jeppard fails to teach or suggest each and every element called for in the present claims. The present claims are clearly directed to patentable subject matter. Accordingly, Appellant believes claims 1, 2, 4-6, 9, 10, and 20-25 are clearly patentably distinct over each reference, alone or in combination, and respectfully requests that the Board find claims 1, 2, 4-6, 9, 10, and 20-25 patentable over the prior art of record and direct withdrawal of all outstanding prior art rejections.

Respectfully submitted,

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